methods of compliance enforcement. Any change in the regulatory environment that would eliminate any cost complementarity enjoyed by a BOC would lead to significant reductions in profits. With an anticipated multi-billion dollar industry in development, the financial costs of triggering changes in regulations would be substantial. Second, the affected parties can rely upon the courts to enforce antitrust laws that protect access to essential facilities. These remedies are in place and provide protection equal to or beyond what other firms enjoy in protecting their rights of access to essential facilities.

The plea for structural separation in order to deter access discrimination is a plea for assurances that have not been provided to any other industry, including those dependent upon essential facilities. The legislatures and the courts obviously feel that the antitrust laws alone are sufficient protection. In the enhanced services market, the potential for additional regulatory controls (structural separation) add to an already burdened cost of non-compliance. The ESPs currently enjoy substantial protection.

If any of the BOCs had the mistaken idea that discriminatory access could be used without detection, the action against Bell South and the result of that legal action should have corrected the mistake. Thus, any systematic attempt at discriminatory access will be discovered by competitor ESPs. The treble damage provision of antitrust actions makes easily discoverable antitrust actions unprofitable. As a result, **necessary condition 3** is not met.

3. Structural Separation and Incentives for Discriminatory Access

The essential issue is, would a structurally separate BOC enhanced services subsidiary reduce the incentive of the BOCs to discriminate in favor of its own operations? The answer is no. The benefits of discriminatory behavior are the same whether or not the BOC's enhanced services subsidiary is structurally separate.

Thus, all of the costs and benefits of discriminatory access apply equally to any BOC that operates its enhanced services through a fully integrated division or as a completely structurally separate company. The shareholders of the parent BOC deserve to have the entire firm operated to maximize profits. Indeed, if a BOC is not operated so as to maximize profits, corporate takeover threats and stockholder revolts will assure that such non-profit maximizing behavior will not persist.

Thus, if through a discriminatory access strategy an integrated BOC will lose less in LEC basic services profits than it gains in enhanced services profits, then a structurally separated BOC will find a discriminatory access strategy just as profitable.

By the same token, if at least one of the three necessary conditions for the profitability of discriminatory access fails to hold for a structurally separated BOC, then those same necessary conditions fail to hold for a fully integrated BOC.

4. The Absence of Access Discrimination

To enhance the provision of LEC basic services to the ESPs, U S WEST participates in the actions of the IILC. The IILC serves the BOCs and the ESPs by providing a forum in which consensus can be reached on appropriate issues without the involvement of regulators. It serves as a place in which ideas and concerns can be exchanged and possible solutions identified. The IILC represents an information marketplace wherein requests regarding unbundling and individual LEC basic services can be coordinated. This process enables BOCs to better service the downstream ESPs, both in identifying specific capabilities to be provided (unbundled) and to evaluate alternative methods of providing more capabilities. Uniformity of service offerings can be established faster resulting in a more rapid growth in the enhanced services market. U S WEST's time and effort spent in participation in the IILC reflects a desire to offer LEC basic services rather than to restrict sales to competing ESPs.

To date, the IILC has improved overall efficiency in the provision of demanded LEC basic services. Both technical and investigative work have been conducted. Information has been exchanged across the BOCs in the most efficient method of offering basic capabilities (unbundling). For instance, U S WEST developed the Two-way DID with call transfer service. The services developed by U S WEST have been documented by the IILC and shared with other BOCs so that these unbundled services could be made available by other LECs upon request. In addition, the FCC has requested the IILC to examine industry needs and major issues to be addressed in network unbundling. Both BOCs and ESPs work toward uniformity so that those unbundled services developed in one region of the country will be similar to those in other areas of the country. This involvement and participation by U S WEST appears at odds with the presumption that U S WEST

seeks to limit access to unbundled services and provides LEC basic services only on a discriminatory basis.

Most importantly, customers of U S WEST have been provided with every reasonable effort to meet their requests. U S WEST and other BOCs have differentiated requests for unbundling and have effectively served the enhanced services industry. To date, no complaints against U S WEST have been filed by competing ESPs for the refusal to provide an unbundled service. This is strong evidence that appropriate unbundling, as prescribed by ONA, is taking place.

5. Market-driven Unbundling

It is important to understand that the unbundling process requires significant expense, and some unbundling cannot reasonably be achieved with existing technology. Capturing information within an existing system is not always straightforward. Software typically must be modified, requiring system modification, error detection and correction, systems construction for repairs, utilization measurement, billing, and compatibility with other operations. Significant resources are expended in the unbundling process. In some instances it is less costly to offer packages of LEC basic services rather than individual services on an a-la-carte basis.

Proponents of structural separation appear to seek "complete" unbundling as though it were in the interest of consumers. In fact, unbundling can progress only with the advance of technology. New basic services are being "discovered" as computer software is improved and updated. Moreover, the mere identification of an LEC basic service does not necessarily mean that it should be unbundled.

Appropriate unbundling is driven by the employment of an LEC basic service as input into the production of a marketable enhanced service. Effective demand for unbundled basic services must be a derived demand from the provision of enhanced services. If there is no downstream demand for the related enhanced service, there is no effective demand for the unbundled basic service. To advance the unbundling process as an end to itself is to incur costs that must ultimately be paid by consumers of enhanced services for which there is no compensating benefit. Unbundling must be market driven if consumers are to receive maximum benefit from enhanced services.

B. The Avoidance of Joint Cost Manipulation

A common complaint with integrated operations is that BOCs will have strong incentives to move the costs of enhanced services into the basic service rate base, thereby artificially increasing the price paid by consumers of basic service. In contrast, structurally separate facilities, management, and operations would preclude such a possibility. Thus, structural separation would presumably eliminate the welfare loss resulting from inflated prices of basic service.

The analysis in Appendix B suggests that the scope for joint cost manipulation is severely circumscribed by several factors. First, it may not be in the BOCs' interest to raise the price of basic service. Increasingly, BOCs are facing entry into the local basic service market, and with the advent of cellular technology, BOCs may feel constrained to hold down the price of basic phone service in order to prevent further erosion of their dominant market shares. But even assuming it is profitable to raise basic service rates by manipulating joint costs with enhanced services, there remains the question of whether existing joint cost accounting techniques would allow such manipulation. The review of these accounting techniques in Appendix B suggests that accounting procedures for separating joint costs are quite explicit and leave little scope for manipulation. For example, employees are designated as to whether they work in basic services, enhanced services, or both. The latter are required to allocate their time based on their work effort in both activities. Similarly, space occupied by enhanced services must be allocated strictly to enhanced services. Finally, under existing audit restrictions, an independent auditor is required to verify the appropriateness of the cost allocation.

To assess the danger of the shifting of these costs one must consider the extent to which a state rate commission is incapable of detecting these costs adjustments. Since these rate commissions have been functioning for decades, it is not appropriate to conclude that these state rate commissions are completely ineffective. For example, BOCs have been permitted to competitively price LEC basic services in order to compete with by-pass technology. Competitors of LEC basic services argued before rate commissions that the BOC could cross-subsidize and predatorily price these competing services. Rate commissions have been examining and ruling on these issues for at least ten years. In the Texas Public Utility Commission (PUC), Docket No. 6771, ROLM Corporation challenged

the method by which Southwestern Bell determined its pricing under its ESSX Custom Tariff. ROLM is a manufacturer of PBX systems which compete with Southwestern Bell's ESSX systems. Both permit the large-scale user to have both inward and outward dialing capability plus intercom calling, call forwarding, and three-way calling. The Texas PUC investigated the arguments. Southwestern Bell was requested by the PUC to provide evidence concerning alleged cross subsidization of an unregulated service. The evidence was presented and understood by the Administrative Law Judge. Importantly, the PUC did not impose any inefficiencies upon the provision of these custom services, recognizing the capabilities of the Commission and its staff to detect any cross-subsidization that would injure public benefits.

Because of the safeguards from existing accounting procedures as outlined in Appendix B, it appears that the likelihood of moving more than 5% or 10% of enhanced service costs into the basic service rate base seems extremely problematic. In 1994, total enhanced service costs represented only about 2.1% compared to the costs of basic service. Assuming 5% of enhanced service costs to be shifted into basic services, this would imply that in 1994, the costs of basic service would be inflated by at most .1%. As shown in Appendix B, the resulting welfare gain from avoiding inflated basic service prices through structural separation tends to be *de minimus*. On a per-access line basis, the welfare gain would appear to be about one ten thousandth of one cent per month. Alternatively for the whole U S WEST region, the annual welfare gain totals $215[13]. Furthermore, if allowance is made for plausible cost complementarities, the welfare gain from eliminating over-pricing basic service is swamped by the welfare loss accompanying the lost cost complementarities from structural separation.

C. Cross Subsidization with Enhanced Services Priced Below Cost

Independent providers fear that the BOCs might choose to deliberately price enhanced services below cost, using the excess profits generated from inflating the basic service rate base.

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[13]For details of these calculations, see Appendix Table B.1.

Accordingly, independent providers of enhanced services might be unable to compete with the BOCs, leaving the BOCs with virtual monopoly control of the enhanced service market. Whereas the usual monopoly condition is a price greater than costs, in this case the monopoly position would arise because the BOC would choose to price enhanced services below costs, making it unattractive for competitors to enter. Even though consumers would benefit from lower enhanced service prices, economic efficiency would not be served since welfare losses would occur from both an artificially high price for basic service and an artificially low price for enhanced services. This situation is entirely analogous to the pattern of cross subsidization often observed in regulated markets. For example, long distance prices were set above marginal costs generating large profits which were then used to subsidize the price of local service. This situation produced welfare losses in both the long distance and local service markets.

But should independent enhanced service providers fear that cross subsidization would occur in the enhanced service and basic service markets? The parallel between the long distance/local service and basic service/enhanced service markets does not hold because in the latter case, only the basic service market is regulated. The prices and profits from enhanced services are unregulated, and this fundamentally alters the incentive to transfer profits earned in the regulated basic service market to the unregulated enhanced service market. When profits in both markets are regulated, the firm does not incur any cost for subsidization because even though it is losing money in the subsidized market, regulators assure that the firm's overall return is fair. But when the subsidized product is unregulated, every dollar spent in pricing its service below cost reduces the firm's profitability. No profit maximizing firm would choose to take excess profits earned from a regulated product (basic service) and use those profits to subsidize an unregulated product (enhanced services). The profit maximizing strategy is to independently maximize profits in both markets, which means pricing enhanced services at or above marginal costs, not below marginal costs.

Empirical confirmation of this theoretical proposition based on simple profit maximizing behavior is contained in numerous industry statistics. Looking across a variety of enhanced service markets, we do not observe monopoly by the BOCs. Using 1994 revenue data, Booz-Allen utilizes data from various sources to show that BOCs' share of various enhanced services ranges from

effectively zero in the E-Mail market to 45% in the voice messaging enhanced services market.[14] Even in the voice messaging market, the market share compares BOCs with other ESPs, excluding direct sales of consumer voice messaging equipment which accounts for another $1.5 billion annually. Looking at the overall market, the BOCs account for less than 25% of sales.[15] This is hardly the type of dominance consistent with the cross subsidization hypothesis. Furthermore, with the vigorous entry of the BOCs in voice messaging, the average price paid for voice messaging has declined almost 50% since 1990.[16]

Clearly, rival producers of enhanced services do not have to fear BOC predatory pricing below costs. Predatory pricing of enhanced services by the BOCs would be self-defeating both in the short as well as the long run since it would be costly to eliminate rivals in the short run and any attempt to raise prices later in excess of costs to makeup for past lost profits would only be met by new entry of rival ESPs.

To summarize, the ESPs need not fear predatory behavior by the BOCs leading to cross subsidization of enhanced services. As discussed previously, if the BOCs succeed in shifting some enhanced service costs into the basic service rate base and thereby earn excess profits in this market, there are no additional welfare effects in the enhanced service market. Neither available market data or profit maximizing firms behavior would lead BOCs to subsidize the price of enhanced services.

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[14]See Appendix C, Exhibit 1.

[15]See Appendix C, Exhibit 2.

[16]See Appendix C, Exhibit 3.

IV. Overall Implications of Cost-Benefit Analysis

A. No Compelling Reason for Structural Separation

The preceding analysis of costs and benefits of structural separation clearly demonstrates that the costs of structural separation are potentially very large, whereas the benefits of separation are limited to safeguarding against access discrimination and avoiding the welfare losses attendant with inflated basic service prices. The costs of structural separation manifest themselves not only in the one-time setup costs of moving to new, separate facilities, but there are important ongoing cost complementarities that will be lost with structural separation. But even more important than the day-to-day saving of being able to use the same personnel and equipment to perform both LEC basic services and enhanced services and to allow convenience-minded customers the opportunity to purchase multiple services from the same sales person, the biggest efficiency losses are likely to fall in the area of cost complementarities in joint R & D. Research scientists working on improved methods of providing LEC basic services use the same techniques as scientists working on enhanced services. Attempting to split the two activities with no interchange between the two groups defies all economic logic. Under joint R & D, the advances in the telecommunications industry are the envy of most industries. A wide spectrum of new enhanced services have sprung from this environment, and to cripple this engine of technological advances would have serious economic repercussions in the future.

Whereas the costs of structural separation are large, the benefits appear small and achievable without requiring structural separation. Basically, there are three alleged benefits from structural separation. First, structural separation would presumably offer additional guarantees that independent enhanced service providers would receive equal access to the necessary interface services required to provide enhanced services. As discussed in Section III, ONA provides clear-cut guidelines for BOC personnel that assure equal access. Furthermore, with the enormous potential future market in enhanced services, it would appear to be extreme folly for a BOC to discriminate against an ESP, since the courts could reimpose the ruling in Computer Inquiry II, requiring structural separation or

go even further, preventing all BOC involvement in the enhanced services market. In addition to these incentives against access discrimination, the antitrust laws with treble damages provide protection against access discrimination under the essential facilities doctrine. In sum, structural separation would appear to add very little at the margin to reduce the incentive to practice access discrimination. Structural separation would not eliminate the incentive to discriminate. The real deterrence comes from non-structural policies such as ONA, the threat of court-mandated separation, or prohibition, and treble damages under the antitrust laws.

The second alleged benefit of structural separation is that it would eliminate the BOCs' ability to inflate the basic service rate base by loading in the costs of enhanced services. Indeed, of the three alleged benefits of separation, it seems clear that structural separation would prevent basic service rate manipulation. Any gain is illusory because there is little or no scope for joint cost manipulation.

The third alleged benefit of structural separation is that it would prevent predatory behavior by the BOCs and the cross subsidization of enhanced service prices at the expense of basic service customers. Concerns of predatory behavior have no basis as a profit maximizing strategy, nor is there any evidence to support such a claim.

B. Implications about the Desirability of a "Level Playing Field" for Enhanced Service Providers

Structural separation would of course eliminate the cost complementarities and R & D advantages of joint production. The resulting separate BOC enhanced services subsidiaries would find that they were no more efficient than other ESPs. Indeed, large firms like MCI might actually have a substantial R & D advantage over BOC enhanced service subsidiaries. Advocates of a "level playing field" would applaud the resulting market structure since it is one that competition would surely thrive in. In contrast, with integrated provision of enhanced services, the ESPs have found those market niches where cost complementarities are not particularly strong and can be overcome by a lean, efficient firm organization. The integrated BOCs are likely to be the main source of new product innovation while the ESPs are likely to be effective imitators, quickly eroding the short term monopoly advantage that goes to the successful innovator.

The fallacy of the "level playing field" analogy is that it unnecessarily wastes resources by raising the BOCs' costs. Furthermore, even though the existing field may not be entirely level, it is not so unlevel as to prevent a vigorous role for the ESPs. Particularly in the enhanced service market, the firm structure that is most efficient is the one that generates the greatest rate of technological breakthroughs in providing new and improved enhanced services. Supporters of the "level playing field" concept overlook the tremendous efficiency generating properties of the current integrated structure.

C. Vigorous Endorsement of ONA's Prescribed Unbundling of Access Services Coupled with Marginal Cost Pricing

The fact that policy makers would be ill-advised to require structural separation does not mean that there is no potential for efficiency-enhancing regulations. The FCC's ONA policy of promoting the unbundling of access services is an excellent example of a policy change which has the effect of promoting a "level playing field" without robbing the BOCs of the cost complementarities from integrated operations. As the enhanced services market evolves, individual suppliers of enhanced services may only require one or a few individual access services. Under ONA they are guaranteed the right to purchase just these services at the long-run incremental cost of providing them. With unbundling, these services are offered on an a la carte basis at prices reflecting their costs. Furthermore, unbundling under ONA assures that all providers of enhanced services (both ESPs and BOCs) pay the same price for. Unbundling prevents the BOCs from gaining an artificial cost advantage vis-a-vis the ESPs because the BOC enhanced service firm can utilize more of the services provided in the bundle than can individual ESPs, who may only need some components of the bundle.

Although one must recognize the importance of unbundling in the development of enhanced services, one must also recognize that the costs of providing individual components of a bundle may exceed the costs of providing them in a bundle. With technological advances, these costs may change in the future as software used in the provision of access services is upgraded. Nevertheless, as long as both individual access components and bundled combinations are offered based on their costs, economic efficiency is promoted.

Clearly, unbundling under ONA promotes competition and eliminates a potential source of access discrimination. Furthermore, it is desirable that the individual services be priced at their marginal costs. Marginal cost pricing of each service means that each supplier of enhanced services incorporates the true social cost of the inputs into its costs. With competition among enhanced service providers, the prices of enhanced services will reflect their social costs leading to the optimal quantities of each being supplied to the market.

V. General Economic Lessons About Firm Structure, Competitive Forces, and Regulation

In this section we explain the economics of firm structure pertinent to the issue at hand. In particular, we review the economic forces that determine the optimal structure of firms, and we examine relevant experience in other industries in which regulatory subsidiary structures and related regulations have been imposed. The evidence from other industries indicates that regulations have frequently resulted in different, less efficient industry and firm structures than market forces would foster. The lifting of regulations offers a chance to observe how industry structure changes in response to unfettered market forces.

A. Determinants of Firm Structure

In the absence of regulatory constraints, market forces ensure that firms efficiently organize and select the proper firm structure. By firm structure, the firm must choose the extent to which it vertically integrates, produces products separately or jointly, and manages the firm through a subsidiary or integrated organizational structure. Modern industrial organization argues that economizing on transaction costs underlies each of these choices.[17] Firms that first select the optimal

[17]Williamson, Oliver E., Markets and hierarchies: analysis and antitrust implications: a study in the economics of internal organization. New York: Free Press, 1975.

organizational structure will reap the profits of this selection, and competitors will quickly follow suit. Overall, fewer resources will be utilized in the production of the output, and consumers will benefit from these efficiencies.

1. Transactions Costs and Cost Complementarities

Just as a major purpose of a market is to reduce transactions costs between buyers and sellers, transaction costs shape the internal structure of the firm. Transactions costs help explain why firms vertically combine, produce joint products, and choose certain organizational structures. Firms integrate vertically upstream (i.e., by producing products previously purchased as an input) or downstream (i.e., by producing those products that use the firm's product as an input) because the transaction costs of internal transactions are less than the transaction costs of market transactions. For example, Ford Motor's decision to produce certain car components and to purchase others ultimately hinges on transaction cost considerations. Internal provision of a good or service may be beneficial when market contracts would have to be written very specifically to accomplish the task at hand, and contract performance may be difficult to define and enforce. For example, in the production of copper anodes (sheets of relatively pure copper) from scrap copper, refineries need a steady flow of copper scrap to maintain efficient production rates. Consequently, it is not unusual for a refining operation to establish its own scrap gathering business to ensure a steady flow of copper scrap to the factory. Consequently, it is sometimes easier to produce in a vertically integrated structure than to incur the difficulties and costs of writing and enforcing very specific performance contracts that have high costs of non-performance, particularly in a changing economic environment.

The decision to produce two or more products jointly depends primarily on cost complementarities. Modern oil refineries producing a wide spectrum of petroleum products such as gasoline, jet fuel, diesel oil, asphalt, and petrochemicals are classic examples of joint production. Technically, it is possible to design oil refineries to produce only one product such as gasoline, but the costs would be prohibitive compared to producing the mix.

2. The Subsidiary Structure: When Is It Useful? When Is It Wasteful?

The firm's choice of management structure can vary widely ranging from stand-alone

subsidiaries with separate management to a highly integrated, centralized management control. Again the choice is likely to depend on transaction costs and cost complementarities. A subsidiary structure is often useful. But when it is desirable, it is usually for a business endeavor with a different focus than that of the parent company.

The subsidiary organization, when market driven, is an efficient structure. But subsidiaries that are regulation-mandated are seldom of the type the market would yield. Separate subsidiaries cannot typically capture the efficiencies of joint production, whereas an integrated firm structure can. When one product is somehow very dependent upon another through joint production or marketing processes, management and planning efficiencies dictate an integrated structure.[18]

B. Industry Examples Where Regulatory Constraints Have Prevented Optimal Firm Structure

1. Texas Branch Banking Prohibitions

An example of an imposed subsidiary structure is Texas banking prior to the 1990s. The state of Texas, wary of large banks, had imposed a regulatory structure prohibiting branch banks but allowing subsidiary banks. They were not called subsidiaries, as they were not originally envisioned to be subsidiaries, but that is what they ended up being. The banks were called "unit banks" or "stand alone" banks. The unit banking structure in Texas prevented branching. A branch is a separate office that accepts deposits and makes loans, but it is still operated under the one corporate bank management as a separate office location. Contrast the banking organizations in Texas with those in California, where branching was allowed. A bank like the Bank Of America has many branch offices throughout the state of California under one management. In Texas each stand alone banking facility had to be a totally separate company, with separate management and separate capitalization. This unit banking structure led to unnecessary duplication costs and inconvenience to consumers who

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[18] For more discussion about the way transactions costs determine firm structure see Oliver E. Williamson, "The Modern Corporation: Origins, Evolution, Attributes", *Journal of Economic Literature* (Dec. 1981), pp. 1537-1568.

found they could cash a check at only one banking location.[19] Because of the inability to fund large loans by any one unit bank, larger banking organizations developed in Texas, called Bank Holding Companies, which managed the unit banks they owned. The bank holding companies chose the management of the subsidiary or unit banks, and their loan participation policies. In this sense, the subsidiary structure prevailing in Texas banking was less restrictive than the subsidiary structure envisioned for the BOCs, because it involved less management separation and more coordination of purposes between the parent and subsidiary companies.

With the easing of bank regulations in Texas, the market has delivered a much heavier reliance on branch banking, leaving the unit bank as an artifact of the past. The lesson from Texas banking for telecommunications is clear. Imposing a subsidiary structure on BOCs for provision of enhanced services would impose costs on consumers of enhanced services, as they pay for the inefficiencies that structure imposes.

2. Gas Pipelines and Special Marketing Affiliates

Until 1985, natural gas pipelines in the US were largely required to serve as gas merchants -- not merely transporters-- purchasing gas upstream, transporting the gas to downstream customers, and then selling the gas. Each pipeline could negotiate its purchase price of gas at the wellhead and negotiate its selling price at the delivery point. Curiously, these pipelines were not permitted to sell transport services to any willing buyer or seller. Unlike the rail and truck transport industries, natural gas pipeline companies were required to take title to all gas to be transported, thereby avoiding the suspected pitfalls of the competitive marketplace. The theory was that only if the pipeline was given the responsibility of supplying downstream customers, shortages of gas downstream would be less likely. The pipelines, under the Federal Energy Regulatory Commission (FERC) regulations, would

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[19] Studies show that accessibility is improved when branching is allowed, and the results hold for metropolitan and rural areas; see Devanoff, Douglas D., "Branch Banking and Service Accessibility", *Journal of Money, Credit and Banking*, 20(2), May 1988, pp.191-202. Also see Saving, T. R. and R. F. Lanzillotti, "State Branching Restrictions and the Availability of Banking Services", *Journal of Money, Credit and Banking*, November, 1969, pp. 778-783, in which they show that for a given population and income there are more banking offices in unit banking states than in branching states in the period they studied.

be required to maintain a constant flow of gas downstream, with the pipeline being the gas purchaser and scheduling agent.

Following the widespread abrogation of gas purchase contracts by the pipelines, FERC allowed pipelines to become common carriers, providing gas transport to any party. But should the pipelines be allowed to form "special marketing affiliates" and purchase transport services on the parent's pipeline? Special marketing affiliates were in fact allowed to be formed as subsidiaries of the pipelines, but these subsidiaries were allowed to share common personnel, offices, and computer equipment. Like an enhanced service provider, they purchased pipeline access from the parent pipeline company. To protect against access discrimination, FERC used regulatory prohibition methods rather than strict separation of facilities. Sanctions were introduced wherein pipelines might be required to allocate more of its capacity to independent gas marketing companies and/or exclude certain assets from the calculation of their rate base. In short, FERC used penalties based upon verified complaints rather than the imposition of efficiency-robbing methods of operations.

The deregulation of the pipelines opened the door for more efficient markets for natural gas to develop. Initially, local spot markets developed, enabling buyers to purchase gas at major terminals across the US. With time, these local spot markets evolved into a national spot market. By 1991, the great majority of gas transported in the US was for spot market transportation. The public benefits from the development of the spot market have been extensive, and the role of the special marketing affiliates has facilitated the process

3. Deregulation of the Airline Industry and the Hub and Spoke System

Support for airline deregulation was spawned by evidence from the unregulated intrastate airline markets of the 1970s. Many analysts believed a deregulated U.S. airline industry would resemble these intrastate markets that were characterized by small regional carriers operating over linear routes with very simple pricing schemes. In contrast, under Civil Aeronautics Board (CAB) regulation, the route and fare structure of the airlines industry were set by regulation.

Following deregulation, the present airline industry in no way resembles the anticipated examples of the small regional, intrastate carriers. But many of the favorable outcomes of deregulation predicted by observers of the industry have been realized. Deregulation has enabled

airlines to reduce operating costs, increase load factors, increase the availability of discount tickets, and increase the number of flights, all without a serious decline in service to small communities or safety.

Many of the fundamental attributes that now characterize the domestic airline industry, such as the hub-and-spoke method of delivery, complex pricing schemes, the dominance of many airports by single carriers, the importance of computer reservation systems, and the growth of loyalty-inducing devices (frequent-flyer programs and travel agent commission overrides) did not exist in the regulated airline industry, and they were not predicted to emerge from deregulation. Recent econometric evidence shows that deregulation led to substantial efficiency gains, resulting from lower labor costs, higher load factors, and more efficient route structures.[20]

Of particular relevance for telecommunications is the advent of the hub-and-spoke system. Deregulation fundamentally altered the route structures of airlines from linear routes imposed by regulation to a hub-and-spoke pattern. Economies of density forced greater concentration of flights between hubs. Likewise, travel to "spoke" cities was driven by the lower cost of moving traffic along an individual route.

All major airlines now have one or more hubs at which many of their long-distance passengers change planes. Since most hub airports can accommodate large-scale operations of only one airline, both logistically and economically, competition has tended to decrease on direct routes to and from the hubs. Yet, because a hub allows an airline to serve a large number of routes with a change of plane at the hub, longer routes are now served by more airlines, each channeling passengers through its particular hub airport. This explains the decline in concentration on longer routes and the increase on shorter routes. On balance, the expansion of the airline networks has produced a significant increase in the number of routes jointly served by major carriers.

The important lesson is that just as market forces caused the unanticipated evolution of the

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[20] Research describing the changes in the airlines industry include Baltagi, Badi, Griffin, J.M. and Daniel Rich, "Airline Deregulation: The Cost Pieces of the Puzzle", *International Economic Review*, February 1995 Borenstein, Severin, "The Evolution of U.S. Airline Competition." *Journal of Economic Perspectives*, Spring 1992, p. 45-73; Evans, William N., "Structure, Conduct, and Performance in the Deregulated Airline Industry", *Southern Economic Journal*, January 1993, p. 450-67.

hub-and-spoke route system, market forces in telecommunications may favor certain products being produced jointly. Just as no one predicted the emergence of the hub-and-spoke system, we should not expect regulators to be able to predict which types of firm structures will and will not have cost complementarities.

C. It Is Difficult for Regulators to Know the Optimal Firm Structure

Transactions costs should determine whether an objective is accomplished by a firm through interfirm contracts in the marketplace or provided within the firm; likewise, cost complementarities should determine whether production is jointly or separately organized. Since it is very difficult for regulators to assess the alternative costs of organizing production, it is very difficult for regulators to know the optimal firm structure. Transactions costs change over time due to changed market conditions, changes in relative prices, and changes in technology. Similarly, the extent of cost complementarities is technology driven. Regulators imposing firm structure have the impossible task of assessing when these costs have changed and selecting the most efficient firm structure.

Regulators, like the economic planners in the former Soviet Union, typically do not possess either the knowledge of these changing forces or the resources to acquire that knowledge. Examples from other industries show that regulatory constraints have often prevented regulated firms from adopting efficient firm structures as evidenced by the dramatic and unpredicted changes following deregulation. In sum, historical experience argues strongly that firm structure should be market-determined.

APPENDIX A

US WEST Enhanced Services Product Status

Product	APPROVED CEI	APPROVED Listed Under CEI filed 3/13/95	NOT YET APPROVED New/Within Six Months
Voice Messaging Service	✔		
Protocol Processing Services	✔		
Voice Storage Service (Trial)	✔	(inactive)	
Electronic Messaging (Trial)	✔	(inactive)	
Community-Link	✔	(Inactive)	
VMS - Parent Teacher Exchange (School Link)	✔		
VMS - Home Metro		✔	
VMS - Extension Mailboxes (shared)		✔	
VMS - Guest Mailbox		✔	
VMS - Enhanced Call Processing and Call Routing		✔	
VMS - Listen Only Mailboxes		✔	
VMS - Spanish Only Mailboxes		✔	
VMS - Voice Forms		✔	
VMS - Stand Alone Mailboxes		✔	
Point of Sale		✔	
Easy Source Audiotex		✔	
FAX Mail		✔	
FAX Request		✔	
Never Busy FAX		✔	
FAX Mail Plus		✔	
Broadcast FAX		✔	
Electronic Classifieds		✔	
Interact Message Switching Service (protocol conversion)		✔	
Your Value Card		✔	
GOTv		✔	
Interactivities		✔	
On-Line Access Marketing Lists		✔	
Audio Magazine		✔	
Call Tally		✔	
U S Avenue		✔	

US WEST Enhanced Services Product Status (continued)

Product	APPROVED CEI	APPROVED Listed Under CEI filed 3/13/95	NOT YET APPROVED New/Within Six Months
Kiosk Ticketing		✔	
News On Demand			✔
VMS - Notification			✔
VMS - Retail			✔
VMS - Hands Free			✔
VMS - Home Office			✔
Directory Assistance Plus			✔
Data Archiving and Retrieval			✔
Automated Infovault			✔
Internet Express			✔
Interprise Netware Connect			✔
Additional Enhancements on Interact			✔
Geographic Information Services			✔
Database Management Services			✔
RealTime Interactive Database Marketing			✔
Broadband PC - Broadband Team - Mass Markets			✔
Electronic Directory Assistance (pending FCC waiver)			✔
Video Dial Tone and application enhancements			✔
Video On Demand Training			✔
Information Service Ticketing			✔
Information Service Topic Board			✔
Multimedia Mailbox			✔
VMS Universal Mailbox			✔
VMS Media			✔
VMS FAX			✔

APPENDIX B

The Economics of Cross Subsidization

I. Industry Concerns

One of the primary arguments in favor of structural separation of enhanced services from basic service is that it eliminates the problem of assigning joint costs. Regulatory experience is replete with examples where joint production resulted in cross subsidization between two related products with the end result being large welfare losses. One need look no further than the cross subsidization between local basic service and long distance telephone service that resulted in large welfare losses and ultimately precipitated the structural dismemberment of AT&T. Even if there were substantial cost complementarities or economies of scope between local and long distance service, the distortionary impact of long distance prices well in excess of long run marginal costs subsidizing local service resulted in large welfare losses,[21] far in excess of any likely gains from joint production.[22]

The obvious question is whether we have an analogous situation here between local basic service and enhanced services. In particular, MCI, among others, poses the question of whether the potential distortionary effects of cross subsidization overshadow any cost savings from joint production. MCI, as a potential competitor in the enhanced service market, expresses their concerns

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[21] See Griffin, James M., "The Welfare Implications of Externalities and Price Elasticities for Telecommunications Pricing," *Review of Economics and Statistics,* February, 1982, 59-66 and Rohlfs, Jeffrey, "Economically Efficient Bell-System Pricing," Bell Laboratory Discussion Paper No. 138, January 1979.

[22] The evidence on cost subadditivity is mixed with Heckman, James J., "A Test for Subadditivity of the Cost Function with an Application to the Bell System," *American Economic Review,* September 1984, 615-623, finding evidence of mild cost subadditivity, while other studies such as by Roller, Lars-Hendrik, "Proper Quadratic Cost Function with an Application to the Bell System," *Review of Economics & Statistics,* May 1990, 202-210, rejecting cost subadditivity. Cost subadditivity involves notions of both economies of scale and scope whereby one firm can supply the market at lower cost than two or more firms.

that cross subsidization could forestall their ability to compete in the enhanced services market. [23] While MCI has not elaborated their theory of how cross subsidization would harm them, the logic would seem to proceed as follows: Through integrated operations, the former Bell Operating Companies (BOCs) will be able to shift costs of enhanced services into the local service rate base, earning excessive returns which would then be used to subsidize the cost of providing enhanced services. With the BOCs operating at an artificial cost advantage in the enhanced service market,[24] MCI and other ESPs will be unable to compete. Under this scenario, not only would MCI and other ESPs be harmed, but economic efficiency would be severely impaired. Just as artificially high prices in excess of the long run marginal costs of local service would produce welfare losses in the local service market, artificially low prices, below costs in the enhanced service market, could also produce potentially large welfare losses in the enhanced service market. Paradoxically, the BOCs would attain a monopoly in enhanced services by setting prices below costs, thereby precluding the entry of companies such as MCI with a reputation for being an aggressive competitor.

The purpose of Appendix B is to examine the theoretical conditions under which the above cross subsidization scenario might occur and to examine the likely welfare effects of manipulation of joint costs. Section II identifies three necessary conditions for cross subsidization to occur and considers whether those conditions occur in this situation. It is shown that at least one (and possibly all three) of the necessary conditions fails to be satisfied, thereby vitiating the scenario outlined above. But having shown that the above cross subsidization scenario cannot occur, does not prove that the ability to manipulate joint costs (by loading the costs of enhanced services into the cost of local service) is benign. Section III examines the welfare effects of raising local service rates through manipulation of joint costs. Specifically, Section III asks what is the welfare loss in the basic service market, given the likely scope for joint cost manipulation.

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[23]For example, see the May 11, 1992 memo from Thomas Campbell on behalf of MCI to the Arizona Corporation Commission, Utilities Division.

[24]For example, see the May 11, 1992 memo from Thomas Campbell on behalf of MCI to the Arizona Corporation Commission, Utilities Division.

II. Necessary Precedents for Cross Subsidization

The purpose of this section is to identify three necessary conditions under which a BOC would artificially increase the price of local service and use the excess profits to subsidize the price of enhanced service below the competitive price that independent suppliers would require. Three necessary conditions would need to be satisfied before such cross subsidization would be an economically rational response.

Condition 1: *The regulatory constraint on the price of local service must be binding.*

Stated differently, for a BOC to wish to engage in joint cost manipulation by assigning joint costs to local basic service, it must be profitable to do so. Clearly, then the preexisting regulated

$$\pi_b(P_b^u) = \pi_b(P_b^r) \qquad \textbf{(B1)}$$

price of local service (P_b^r) must be below the unconstrained profit maximizing price (P_b^U): where $\pi_b(\cdot)$ refers to the profit level corresponding to a given price of basic service. If alternatively, regulation was not binding so that the price of local service had already obtained the profit maximum ($P_b^u = P_b^r$), securing an additional rate increase in local service would only lower profits accruing from local service.

Ten years ago, this condition would surely have been satisfied. Virtually all available estimates of the price elasticity of demand for local service show that market demand is highly price inelastic,[25] and it is well known that a monopoly price must fall in the elastic portion of the demand schedule. Indeed, Taylor (1984) cites a variety of studies that place the price elasticity of local service demand between -.05 and -.17, suggesting there is ample room to increase local service prices. The advent of local exchange by-pass competition suggests that the BOCs' demand schedule is much

[25]See Taylor, Lester D., Telecommunications Demand: A Survey and Critique, (Ballinger, Cambridge, 1980).

more elastic than the market demand. Now with the introduction of cellular technology, it is unclear whether BOCs can profit from higher local exchange prices.

Condition 2: *Joint cost allocation procedures must leave room for rate manipulation.*

Not only must the regulated BOC have an incentive to raise the regulated price of local service, but regulatory procedures must be sufficiently flexible so that this can be accomplished. Joint production has traditionally posed a severe problem to regulators. Long run incremental or marginal costs of both basic and enhanced services can typically be determined, but the problem is that marginal cost pricing will not always allow the BOC to earn a fair rate of return. For this reason, economists routinely prescribe some variant of non-linear pricing schedules that discriminate among inframarginal users and/or use Ramsey pricing to discriminate between two or more classes of customers.[26] The basic idea is to cover joint fixed costs by some allocation procedure that minimizes the welfare losses in the affected markets.

In practice, the economist's prescriptions for allocating these general overhead costs efficiently are seldom implemented. Instead, regulators adopt cost allocation methodologies based on various accounting conventions. In the context of the above scenario, the question becomes whether such accounting conventions are sufficiently flexible to enable the BOC to shift the cost allocation formula so as to raise the price of basic service above the preexisting level. This question is examined in some detail in the next section. It concludes that the joint cost allocation method promulgated in 1986[27] leaves only a modest scope for opportunistic joint cost allocation. Furthermore, under existing conditions, the enhanced service market is so small relative to basic service that the ability to increase reported basic service prices is quite limited. In sum, it appears that BOCs are constrained in their ability to shift joint costs in sufficient magnitude to effectuate a more than 5 or 10% reduction in the price of enhanced services. Whether a subsidy of this magnitude would be sufficient to guarantee the BOC dominance of these markets is problematic.

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[26]See Brown and David Sibley, The Theory of Public Utility Pricing, (Cambridge Press, Cambridge, 1986 and Breautigam, Ron, "Optimal Policies for Natural Monopolies," in Handbook of Industrial Organization, Vol. II (Eds. Schumalensee and Willig), New York, 1989.

[27]See FCC Docket 86-111. Also see Schumacher & Company, Section VI of "Regulatory Impact Review of U S West Advanced Technologies, Inc.", 1992 Report.

Condition 3: *The enhanced service market must also be subject to regulation.*

A regulated enhanced service market is also a key necessary condition to justify why an BOC might want to subsidize enhanced services at the expense of the local service market. If enhanced services were also subject to rate of return regulation, the excess profits made in basic service could subsidize enhanced services with the BOC earning a fair rate of return in the aggregated markets. Mathematically, profits earned in basic service $\pi_b(\cdot)$ less losses in the enhanced services $\pi_e(\cdot)$ are sufficient for the firm to earn an overall fair rate of return (r) on combined capital ($K_b + K_e$):

$$\pi_b(P_b^r) + \pi_e(P_e^r) = r(K_b + K_e) \qquad \textbf{(B2)}$$

The regulated firm, being protected from competition, is free to adopt a variety of objectives such as the maximization of managerial perks. One model, developed by Baumol (1962), proposed that firms maximize sales or firm growth. Enhanced services hold enormous potential for revenue growth, whereas the provision of basic local service is a mature market with essentially 100% market penetration. A vibrant, growing company holds forth the promise of numerous high level managerial jobs to existing personnel. Even though Baumol's model has limited applicability in an unregulated market setting in which competitive forces limit manager's discretion, it would appear that in a regulated setting, a subsidized enhanced service market has enormous growth possibilities. Moreover, regulation provides a safe harbor in which managers can pursue growth maximization with immunity.[28]

But what if the rate of return earned in the enhanced service market is not subject to rate of return regulation? Would a BOC still rationally choose such a cross subsidization scheme. In this case, there is an opportunity cost to using the excess profits earned in the basic service market for subsidizing the price of enhanced services. Each dollar spent in subsidy in the enhanced service market is a dollar lost due to pricing enhanced services below cost. Overall profits of the BOC would

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[28]For example, there are no rival producers forcing firms to practice marginal cost pricing. Furthermore, since the return from both products is regulated, there are no possible gains from stock value enhancement via corporate takeovers. Indeed, to the extent that regulators grant returns in excess of costs of capital, stockholders' and managers' interests will be mutually aligned with a growth maximization objective.

be increased by eliminating the subsidy price (P_e^s) and pricing enhanced services to maximize profits (P_e^*):

$$\pi_b(P_b^r) + \pi_e(P_e^s) < \pi_b(P_b^r) + \pi_e(P_e^*) \qquad \textbf{(B3)}$$

Clearly, since enhanced services are unregulated, there is generally no incentive to cross subsidize.[29] While the BOC may still engage in joint cost manipulation to increase profits in local service, it would be inconsistent with profit maximization to engage in selling enhanced services at below marginal costs.

III. Welfare Effects of an Inflated Basic Service Rate Base

The previous section shows that BOCs may well have both the incentive and ability to shift joint costs (conditions 1 and 2) into the basic service rate base. Consequently, the BOCs may earn windfall profit from basic service customers which will show up as accounting profits in enhanced services operations. However, as shown in condition 3, there is no reason for this windfall to be used to subsidize the price of enhanced services. The purpose of this section is to show that any resulting welfare losses in the basic service market from shifting joint costs are likely to be quite small for two reasons. First, existing joint cost accounting conventions leave the BOCs with very little latitude for manipulating joint costs. Second, even if BOCs are successful in shifting some of these costs, the resulting welfare losses are likely to be inconsequential.

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[29]Implicit in the selection of (P_e^*) is the fact that at the competitive equilibrium price for ESPs, (P_e^c), is the notion that (P_e^*) will not fall more than epsilon below (P_e^c) because at (P_e^c), the BOC's marginal revenue equals (P_e^c). Any lower price will result in a marginal revenue much less than marginal costs (less any offsets via cost shifting).